IEM's AI Modeling: Short-term COVID-19 Projections
Date: 11/2/20

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background
IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 11/2/20 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

IEM's Modeling Lead
Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Georgia State Projections
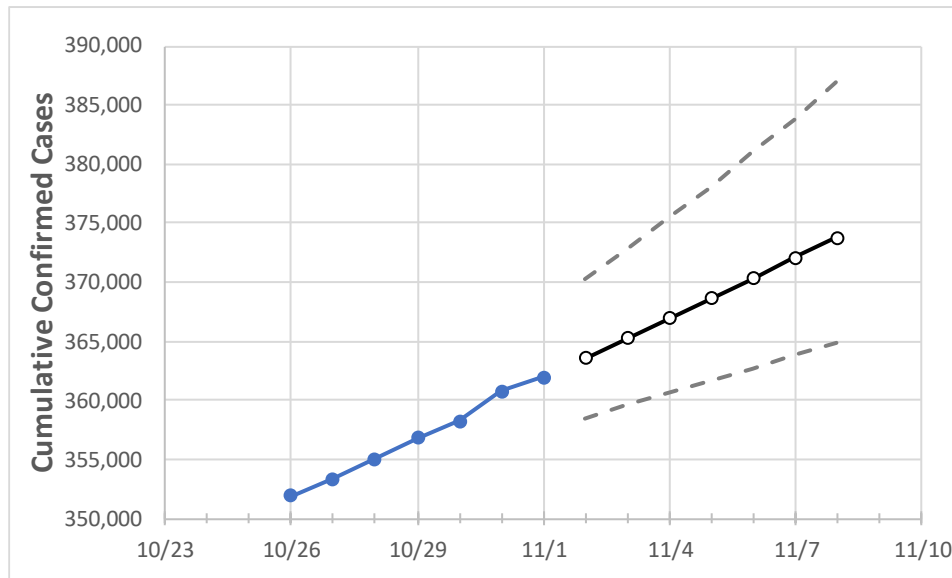
	Actual Confirmed Cases On:				Projected Cases For:						
	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8
Georgia	356,848	358,225	360,790	361,982	363,597	365,236	366,899	368,588	370,302	372,042	373,808

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 20%, and are often within 10%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8
Bartow	3,667	3,689	3,714	3,714	3,740	3,767	3,794	3,821	3,848	3,875	3,903
Carroll	3,360	3,370	3,417	3,428	3,441	3,454	3,466	3,478	3,490	3,502	3,514
Cherokee	7,219	7,242	7,318	7,364	7,406	7,448	7,491	7,535	7,579	7,625	7,671
Clarke	5,787	5,809	5,848	5,865	5,889	5,914	5,939	5,965	5,992	6,019	6,046
Clayton	8,298	8,362	8,417	8,467	8,512	8,558	8,604	8,651	8,698	8,746	8,794
Cobb	22,059	22,132	22,342	22,375	22,458	22,543	22,628	22,715	22,802	22,891	22,980
DeKalb	21,335	21,441	21,587	21,678	21,780	21,884	21,990	22,097	22,206	22,318	22,431
Dougherty	3,305	3,307	3,312	3,318	3,321	3,324	3,327	3,330	3,333	3,336	3,339
Douglas	4,135	4,147	4,197	4,204	4,217	4,230	4,242	4,255	4,267	4,280	4,293
Fulton	31,315	31,428	31,655	31,753	31,897	32,042	32,191	32,341	32,494	32,650	32,808
Gwinnett	30,746	30,894	31,102	31,218	31,326	31,435	31,546	31,658	31,772	31,887	32,003
Hall	10,740	10,785	10,837	10,845	10,868	10,891	10,913	10,935	10,956	10,976	10,997
Henry	6,269	6,304	6,359	6,395	6,430	6,465	6,501	6,536	6,572	6,609	6,646
Lee	750	752	755	756	757	758	759	761	762	763	764

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- *Beds: For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.*
- *ICU: The CDC report found that 24% of hospitalized cases require ICU care.*
- *Ventilators: Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.*

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

*The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.*

Georgia Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	10/29	10/30	10/31	11/1	11/3	11/5	11/7
Bartow	3,667	3,689	3,714	3,714	3,767 (753) [181] {90}	3,821 (764) [183] {92}	3,875 (775) [186] {93}
Carroll	3,360	3,370	3,417	3,428	3,454 (691) [166] {83}	3,478 (696) [167] {83}	3,502 (700) [168] {84}
Cherokee	7,219	7,242	7,318	7,364	7,448 (1,490) [357] {179}	7,535 (1,507) [362] {181}	7,625 (1,525) [366] {183}
Clarke	5,787	5,809	5,848	5,865	5,914 (1,183) [284] {142}	5,965 (1,193) [286] {143}	6,019 (1,204) [289] {144}
Clayton	8,298	8,362	8,417	8,467	8,558 (1,712) [411] {205}	8,651 (1,730) [415] {208}	8,746 (1,749) [420] {210}
Cobb	22,059	22,132	22,342	22,375	22,543 (4,509) [1,082] {541}	22,715 (4,543) [1,090] {545}	22,891 (4,578) [1,099] {549}
DeKalb	21,335	21,441	21,587	21,678	21,884 (4,377) [1,050] {525}	22,097 (4,419) [1,061] {530}	22,318 (4,464) [1,071] {536}
Dougherty	3,305	3,307	3,312	3,318	3,324 (665) [160] {80}	3,330 (666) [160] {80}	3,336 (667) [160] {80}
Douglas	4,135	4,147	4,197	4,204	4,230 (846) [203] {102}	4,255 (851) [204] {102}	4,280 (856) [205] {103}
Fulton	31,315	31,428	31,655	31,753	32,042 (6,408) [1,538] {769}	32,341 (6,468) [1,552] {776}	32,650 (6,530) [1,567] {784}
Gwinnett	30,746	30,894	31,102	31,218	31,435 (6,287) [1,509] {754}	31,658 (6,332) [1,520] {760}	31,887 (6,377) [1,531] {765}
Hall	10,740	10,785	10,837	10,845	10,891 (2,178) [523] {261}	10,935 (2,187) [525] {262}	10,976 (2,195) [527] {263}
Henry	6,269	6,304	6,359	6,395	6,465 (1,293) [310] {155}	6,536 (1,307) [314] {157}	6,609 (1,322) [317] {159}
Lee	750	752	755	756	758 (152) [36] {18}	761 (152) [37] {18}	763 (153) [37] {18}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.